Name: Date:

Exam: Function Reflections (Solution version 628)

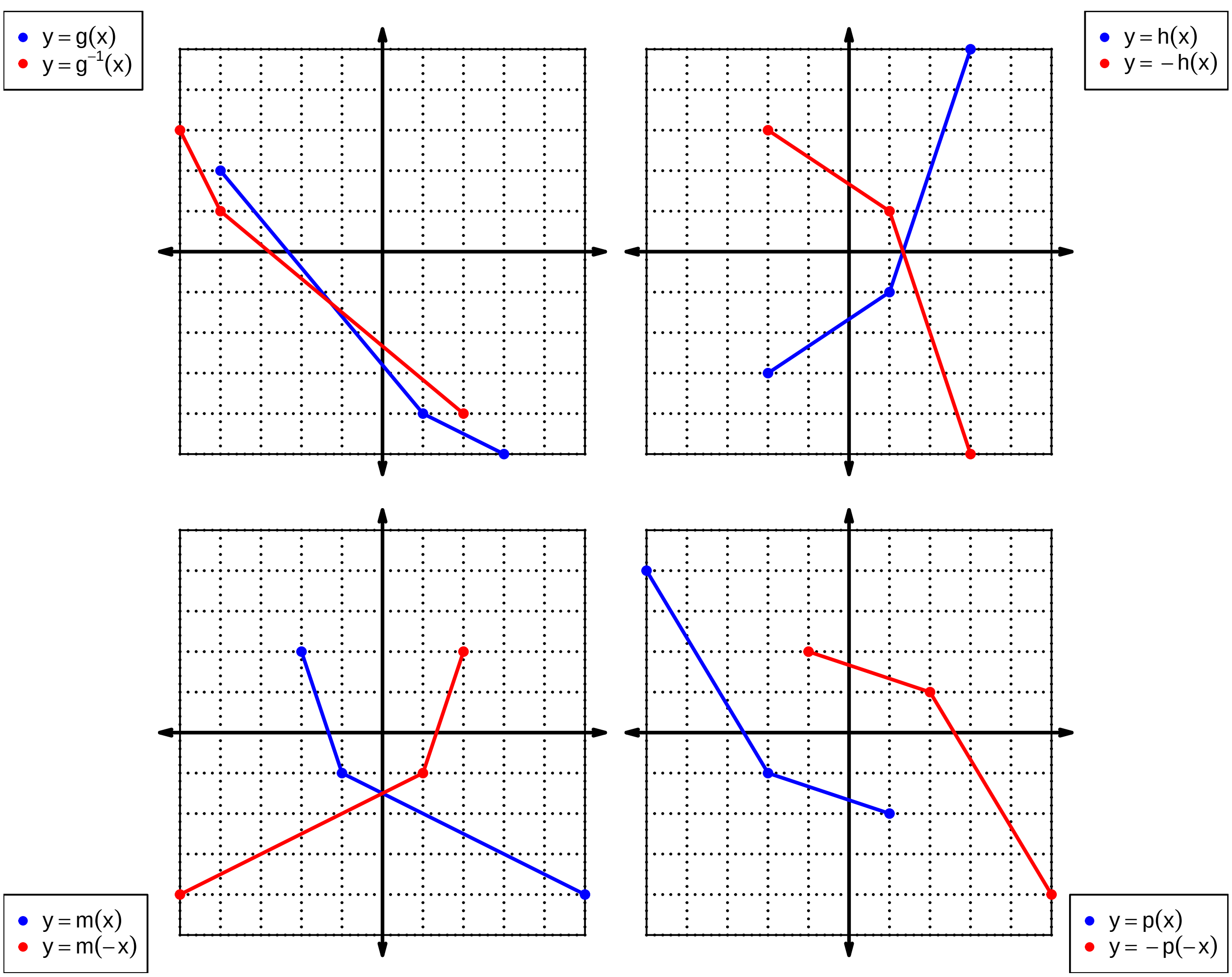
1. (worth 9 points) Let function f be defined by the polynomial below:

$$f(x) \;=\; 4x^5 + 2x^4 + 8x^3 + 9x^2 - 5x + 3$$

Draw lines that match each function reflection with its polynomial:

Reflections	Polynomials
$-f(x)$	$-4x^5 - 2x^4 - 8x^3 - 9x^2 + 5x - 3$
$-f(-x)$	$4x^5 - 2x^4 + 8x^3 - 9x^2 - 5x - 3$
$f(-x)$	$-4x^5 + 2x^4 - 8x^3 + 9x^2 + 5x + 3$

2. (worth 20 points) In each xy plane shown below, a function is graphed with blue. Draw the indicated reflections (as a second curve, indicated in legend) with black (or with whatever you have). The x axis is horizontal and the y axis is vertical (as typical), and the scale is equal on both axes.



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For all questions on this page, the functions f, g, and h are defined by the table below.

x	$f(x)$	$g(x)$	$h(x)$
1	8	6	9
2	6	1	5
3	1	5	6
4	3	2	2
5	4	9	7
6	7	8	4
7	9	4	3
8	5	7	8
9	2	3	1

3. (worth 3 points) Evaluate $g(3)$.

$$g(3) = 5$$

4. (worth 3 points) Evaluate $h^{-1}(9)$.

$$h^{-1}(9) = 1$$

5. (worth 3 points) Assuming h is an **odd** function, evaluate $h(-4)$.

If function h is odd, then

$$h(-4) = -2$$

6. (worth 3 points) Assuming f is an **even** function, evaluate $f(-7)$.

If function f is even, then

$$f(-7) = 9$$

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7. (worth 15 points) A function, f, is **even** if $f(x) = f(-x)$ for all x in the domain. A function, g, is **odd** if $g(x) = -g(-x)$ for all x in the domain.
   Let polynomial p be defined with the following equation:

$$p(x) \;=\; -x^3 + x$$

   a. Express $p(-x)$ as a polynomial in standard form.

$$\begin{aligned} p(-x) \;&=\; -(-x)^3 + (-x) \\ p(-x) \;&=\; x^3 - x \end{aligned}$$

   b. Express $-p(-x)$ as a polynomial in standard form.

$$\begin{aligned} -p(-x) \;&=\; -\left(x^3 - x\right) \\ -p(-x) \;&=\; -x^3 + x \end{aligned}$$

   c. Is polynomial p even, odd, or neither?

   odd

   d. Explain how you know the answer to part c.

   We see that $p(x) = -p(-x)$ for all x because $p(x)$ and $-p(-x)$ are equivalent polynomials. Thus function p satisfies the criterion for being an odd function.

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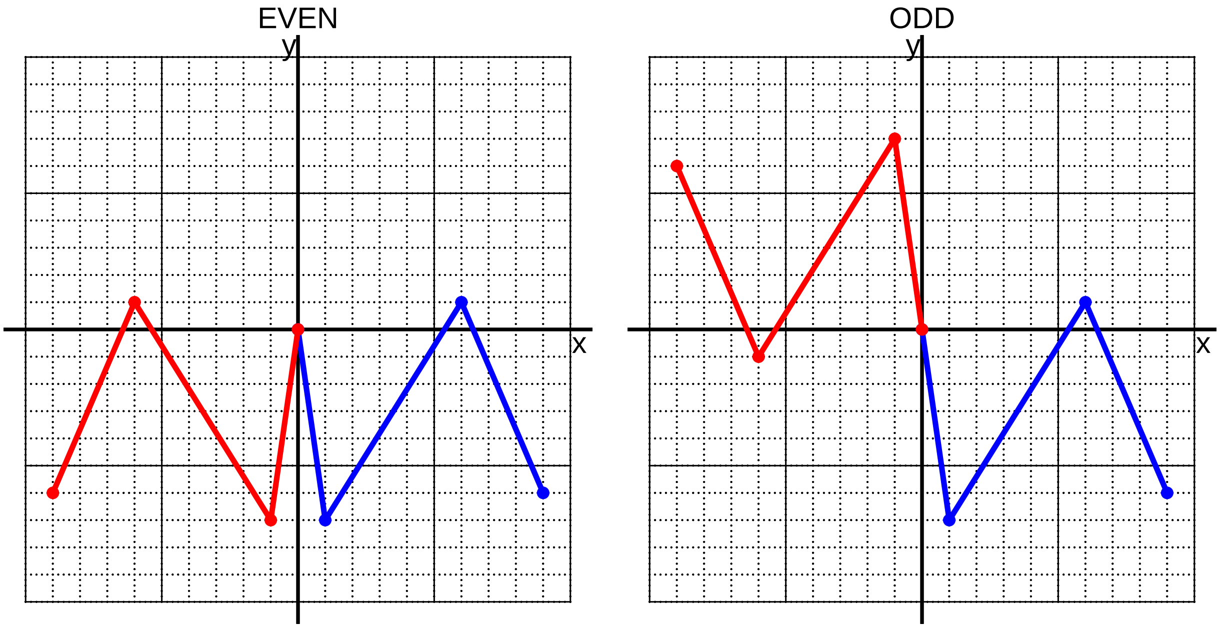
8. (worth 10 points) I have drawn half of a function. Draw the other half to make it even or odd.



9. (worth 10 points) Let function f be defined with the equation below.

$$f(x) \;=\; \frac{x+6}{3}$$

a. Evaluate $f(75)$.

step 1: add 6
step 2: divide by 3

$$f(75) \;=\; \frac{(75)+6}{3}$$
$$f(75) \;=\; 27$$

b. Evaluate $f^{-1}(28)$.

step 1: multiply by 3
step 2: subtract 6

$$f^{-1}(x) \;=\; 3x-6$$
$$f^{-1}(28) \;=\; 3(28)-6$$
$$f^{-1}(28) \;=\; 78$$

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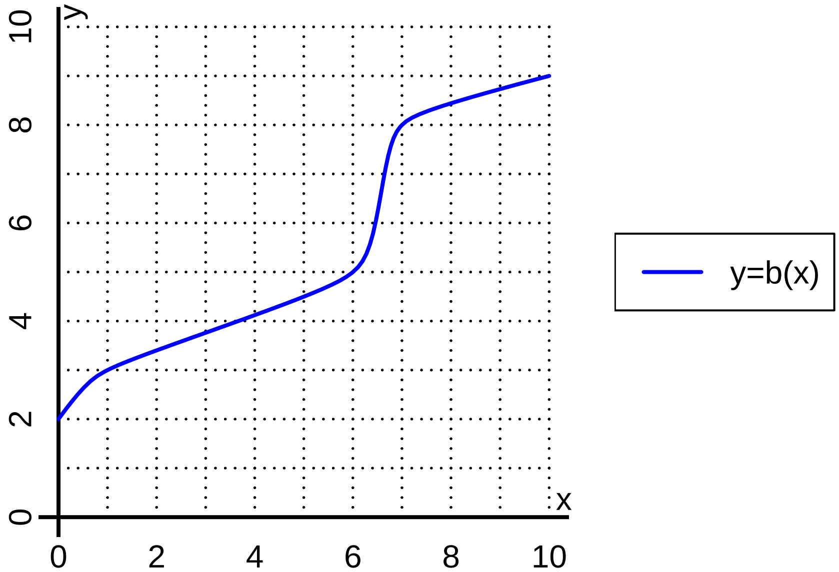
10. (worth 6 points) The function b is represented by the curve $y = b(x)$ graphed below.



a. Evaluate $b(7)$.

$$b(7) \;=\; 8$$

b. Evaluate $b^{-1}(3)$.

$$b^{-1}(3) \;=\; 1$$

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11. (worth 18 points) Function f is defined by the table below.

    a. Complete the columns for $-f(x)$ and $f(-x)$ and $-f(-x)$.

x	$f(x)$	$-f(x)$	$f(-x)$	$-f(-x)$
-2	-3	3	3	-3
-1	-7	7	-7	7
0	0	0	0	0
1	-7	7	-7	7
2	3	-3	-3	3

b. Is function f even, odd, or neither?

neither

c. How do you know the answer to part b?

Function f is neither because neither column $-f(-x)$ nor column $f(-x)$ matches column $f(x)$ exactly.